I chaired a working group meeting June 19, 1990 from 10:00 a.m. until 12:00 noon to investigate high-density interconnection issues for SCSI-2. Almost all of the meeting was consumed in presentations from the following people:

<table>
<thead>
<tr>
<th>Company</th>
<th>Name/phone</th>
<th>Foils</th>
<th>H/W</th>
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<tbody>
<tr>
<td>NCR</td>
<td>John Lohmeyer</td>
<td>no</td>
<td>yes</td>
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<tr>
<td>(316) 636-8703</td>
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<td>Hewlett Packard</td>
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<td>yes</td>
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<td>(916) 785-4204</td>
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<tr>
<td>Icontec</td>
<td>Alan Haig</td>
<td>yes</td>
<td>yes</td>
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<td>(408) 945-7766</td>
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<tr>
<td>Context Elect./Mold-Con</td>
<td>Roger Brickley</td>
<td>yes</td>
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<td>CMS</td>
<td>Wayne Douglas</td>
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<td>Connective Technologies</td>
<td>Fred Hengelhaupt</td>
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<td>Black Box Corp.</td>
<td>Bob Stevens</td>
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<td>(412) 746-6829</td>
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<td>Amphenol</td>
<td>Bill Sopchak</td>
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<td>(607) 786-4370</td>
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<tr>
<td>AMP</td>
<td>Bob Whiteman</td>
<td>yes</td>
<td>yes</td>
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<td>(717) 780-7481</td>
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<td>Honda Connector</td>
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<td>Fujitsu</td>
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<td>(408) 562-1722</td>
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<td>3M</td>
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<td>(512) 984-6807</td>
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<td>Hirose Electric</td>
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<td>JAE</td>
<td>David Shaff</td>
<td>yes</td>
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<td>(714) 753-2600</td>
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I have attached copies of the presentations which were made available to me.

Some issues that were identified are:

1. NCR has experienced difficulties in finding cost-effective solutions for mixing high-density shielded connectors on cabinets with nonshielded low-density connectors inside cabinets. They are especially concerned about finding good solutions for the upcoming P cable.

2. HP has experienced bent pin problems with the high-density connector when mounted horizontally with cables long enough to cause the connector to sag (droop). They are considering using jackscrews instead of the clips shown in the SCSI-2 figures. The cable droop does not cause loss of electrical continuity, but can deform the pins.

3. Several cable assembly vendors pointed out that all of their customers for SCSI cables have unique requirements. There is no such thing as "the" SCSI cable.

4. One cable assembly vendor strongly recommended against using 2-56 jackscrews presumably because they are too weak and break when over tightened. (Later in the week, I learned that the HIPPI standard will call out 2-56 jackscrews with a minimum torque specification that can be met with stainless steel screws. The 4-40 screws have interference problems.)

5. Some customers are frustrated by slow delivery times on the high-density connectors.

6. Bob Whiteman (AMP) showed a prototype 68-position daisy-chain high-density connector which uses 0.025 inch centerline ribbon cable.

No follow-up meeting is planned, however the HP issue concerning the retention mechanism will be included on the August X3T9.2 agenda.

Attachments:
HIGH-DENSITY CONNECTOR ISSUES
HIGH-DENSITY CONNECTOR ISSUES

- Problems encountered
- Cable sag
  - Standard testing
  - Connection break testing
- Failures
- Availability
- Retaining clips
- Jackscrews
- Recommendation
PROBLEMS ENCOUNTERED

- Cable Sag
- Availability
- Standard not unanimously followed
CABLE SAG

- Sagging connector lacks "look of quality"
  Does not look like a ten year product

- Several questions from internal customers

- Will end-users have same reliability questions?
STANDARD TESTS

- Environmental
  Temperature and humidity

- RFI / EMI

- Shake and Vibration
CONNECTION BREAK TEST

- Passed electrical continuity
  Data integrity maintained

- Mechanical failure
  Pins lost alignment during life testing
FAILURES

- Push through
- Ripped shield
- Bent pins
AVAILABILITY

- Manufacturers are having difficulties designing molded housing
  
  Common complaint: inconsistent dimensions between connector manufacturers

- Of 5 cable houses evaluated to date, only 1 latch design worked

- Most cable manufacturers have experience with jackscrews
RETAINING CLIPS

- Excessive cable sag
- Difficult to manufacture
- Not unanimously recognized as part of Standard

Has committee thoroughly evaluated the latches?
JACKSCREWS

- Holds the assembly rigid, eliminating sag

- Easily manufactured

- Modern jackscrews are easy to use
  Peripheral connecting is not a frequent event
RECOMMENDATION: committee approve jackscrews as an alternate to latches
VARIABLES TO SCSI II SOLUTIONS

**Typical** Mech. Variables for General Computer Cable Assemblies

- Conductor O.D.
- Wire Gage
- O.D. of Cable

**Additional Variables for SCSI-2**

Type of Insulation:

- Polypropylene
- Polyethylene
- Polyolefin
- Solid or Foam

Type of Termination Equipment

- Manual
- Semi-Automatic
- Laminating (if necessary for termination)

External or Internal

Internal - need lamination

- Strain relief for bulk head connector
- Organize wires on .050 center for standard IDC .100 grid connectors.

External

- Post mold effect on insulation
- Metal back shell - too much compression of conductors at can entrance.
EXTERNAL SCSI II

Cable Termination: Insulation Types - 28 & 30 AWG
PVC
Polypropylene
Polyethylene
Polyolefin
Cellular HDPE

High Volume Capacity Connector Termination: AMP, Inc
Honda
Fujitsu

High Volume Capacity:
Post Molded Version over
Metal Can Shielding System: AMP, Inc.
Honda

Benefits: Production of finished assemblies ranging from 75-80 ohms thru 95-100 ohms single end mode while utilizing any one of three major connector manufactures.

INTERNAL SCSI II

Flat Ribbon Cable - IDC

Laminated "Round to Flat" Twisted Pair: 28 & 30 AWG
PVC
Polypropylene
Polyethylene
Polyolefin

Daisy Chain Capabilities - 28 & 30 AWG with above insulation systems.

Benefits: Allows High Density SCSI II I/O to standard 50 position IDC Sockets used on drive and controller cards.

Features: a) Improved impedance values to minimize delta with external cable.
b) Superior airflow over Flat Ribbon
c) Easier Routing
d) Daisy Chain Capabilities
e) Integration of Terminator requirements at the internal cable.
Available with squeeze to release latching mechanism or thumbscrews (4-40 or 2-56).
- Meets SCSI and IPI standards.
- Offered in fork and blade or micro-ribbon style.
- ESD protection through plastic latches and molded thumbscrews.
- A full line of Terminators available.
- 100 percent EMI & RFI shielded.
- Custom logos and choice of color.

FOR MORE INFORMATION CALL ....
CONTEX/MOLDCON. TEL. (413)736-0371 FAX. (413)736-9716
CONTEX/TRI-TEC. TEL. (213)327-3960 FAX. (213)515-1691
Component Manufacturing Service, Inc.
One Component Park
West Bridgewater, Massachusetts 02379
• Founded in 1947, extensive experience in providing full service interconnection solutions.

• Principal business of custom Molded-On® products and cable assemblies.

• Technical expertise/experience to develop proper shielding or ground techniques and solutions for custom needs.

• 100% of all cable assemblies are tested at final inspection to meet or exceed customer specifications.

• Total responsibility of in-house design and tooling capability.

• Worldwide supplier from multiple manufacturing facilities in the United States and Europe.
Three Critical Operations

- Cable selection and preparation
- Connector selection and assembly
- Cable assembly fabrication methods
Shielded Cable Assembly Methods

- Lead Foil
- Copper Foil
- Braid Straps
- Silver Bullet
- PCB's
- Plated Plastic
- Zicad Can
CMS Molded-On® Advantages

- Color matching to system
- Custom logo or part number molded in
- Date code with traceability
- Durable and tamper proof
- Attractive compact designs
- Cost effective shielding methods
**CMS AND SCSI II**

**THE RIGHT CONNECTION**

- Molded-On® cable assembly
- Logo or part number molded into connector
- Squeeze-to-release spring latch or jackscrew hardware
- Straight out or angular exit
- Streamlined flex strain relief

- Compliance with SCSI II, EIA RS-232, enhanced IPI, and HPPI standards
- High-density D type interface featuring .050 [1.27] contact centerline spacing
- Attractive, durable finish molding with color matching to your system

**COMPONENT MANUFACTURING SERVICE, INC.**
**ONE COMPONENT PARK**
**WEST BRIDGEWATER, MASSACHUSETTS 02379**
**508-580-0111**
APPLICATION #1
High Density System Interconnections

3M INTERCONNECT SYSTEMS
APPLICATION #2

High Density Board–Panel–Board System

3M INTERCONNECT SYSTEMS
APPLICATION #3
High Density Board-Cable-Panel to I/O Cable System

3M INTERCONNECT SYSTEMS
APPLICATION #4
High Density Board–Cable–Panel to I/O Cable System

3M INTERCONNECT SYSTEMS
APPLICATION #5

Daisy chained board and I/O connectors

3M INTERCONNECT SYSTEMS
APPLICATION #1
High Density System Interconnections
3M INTERCONNECT SYSTEMS

APPLICATION #2
High Density Board–Panel–Board System
3M INTERCONNECT SYSTEMS

APPLICATION #3
High Density Board–Cable–Panel to I/O Cable System
3M INTERCONNECT SYSTEMS

APPLICATION #4
High Density Board–Cable–Panel to I/O Cable System
3M INTERCONNECT SYSTEMS

APPLICATION #5
Daisy chained board and I/O connectors
3M INTERCONNECT SYSTEMS

3M MINI DELTA RIBBON APPLICATIONS